Expert Meeting

on SMEs and Their Access and Use of Government Innovation

Geneva, May 16 and 17, 2019

Brazil

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Head, Innovation Agency, Pontifical Catholic University of Rio de Janeiro, and

President and Chair of the Board, FORTEC - National Association of Managers of Innovation and Technology Transfer

Rio de Janeiro, Brazil

TERRITORY

BRAZIL IS THE **WORLD'S FIFTH LARGEST COUNTRY** IN TERRITORIAL SIZE.

NUMBER OF COUNTRIES BORDERING BRAZIL: **10**

source:
http://www.brazil.gov.br/

POPULATION

207.6 MILLION
Source: IBGE - July 1st 2017

ECONOMICALLY ACTIVE POPULATION (EAP): 90.2 MILLION
Source: PNAD (National Household Sample Survey), 2017

URBAN POPULATION: 84.4%
Source: IBGE - 2010 Census

source:
http://www.brazil.gov.br/

BRAZIL HOLDS **THE GREATEST DIVERSITY** OF SPECIES IN THE WORLD:

- The country has six terrestrial biomes and three large marine ecosystems
- More than 103,870 animal species
- 43,020 plant species
- 20% of all identified species of the planet

source:
http://www.brazil.gov.br/

BIOMES

DIFFERENT CLIMATIC ZONES FAVOUR THE FORMATION OF BIOMES:

- Amazon rainforest - largest rain forest in the world
- Pantanal - largest floodplain
- Cerrado - with its savannas and woods
- Caatinga - several semi-arid forests
- Pampas - prairies and fields
- Atlantic Forest - tropical rainforest

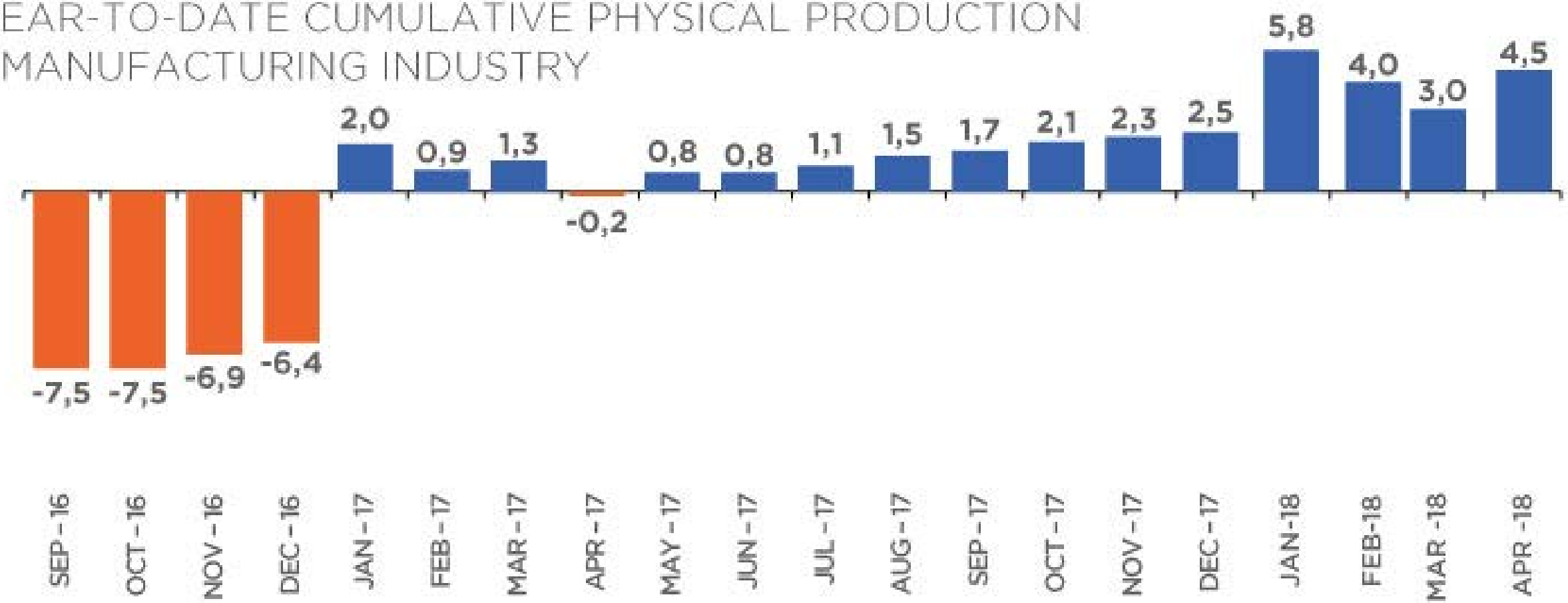
source:
http://www.brazil.gov.br/

GDP GROSS DOMESTIC PRODUCT

CUMULATIVE RATE HROUGHOUT THE YEAR, GDP

INDUSTRY OUTPUT

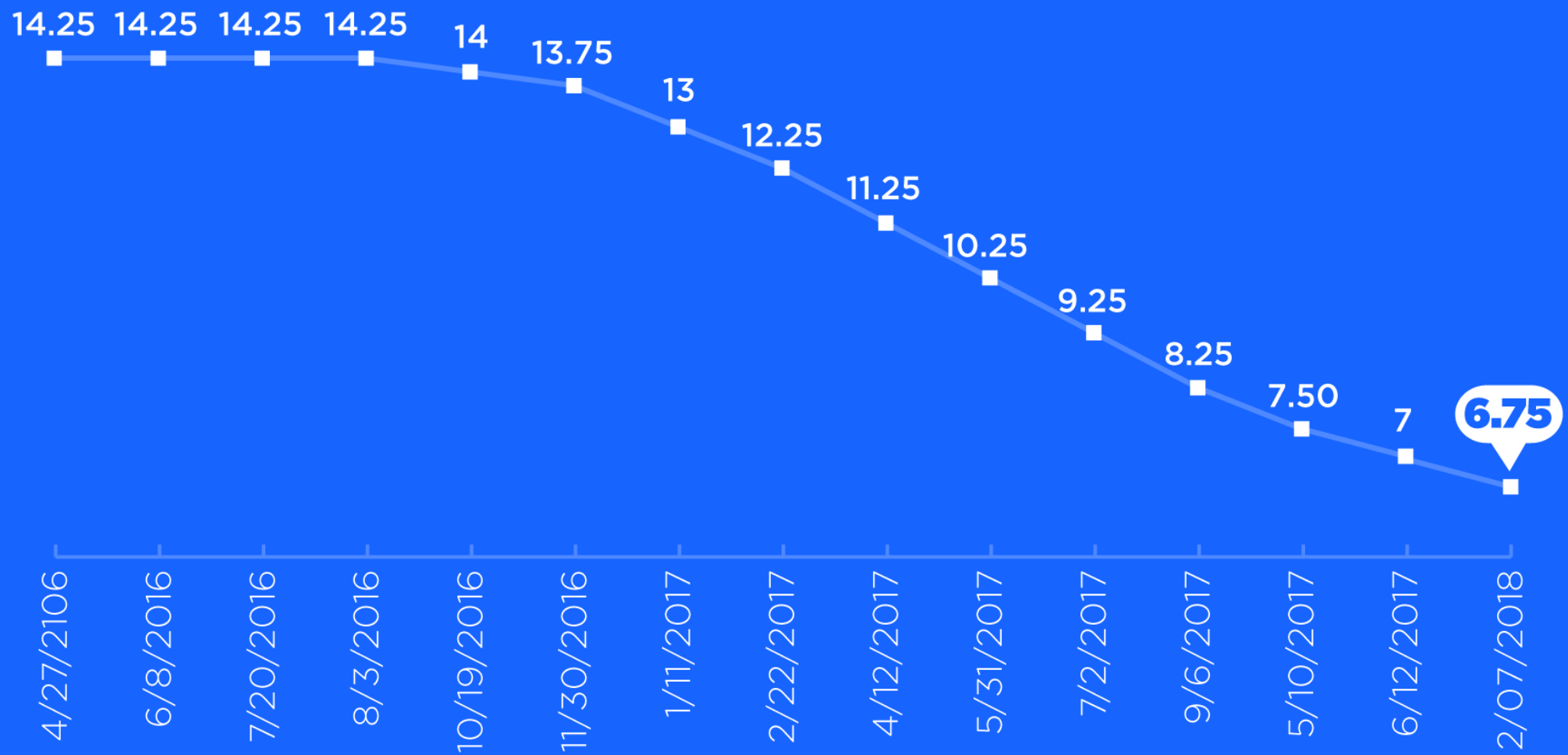
YEAR-TO-DATE CUMULATIVE PHYSICAL PRODUCTION
- MANUFACTURING INDUSTRY



Source: IBGE

BASIC INTEREST RATE

SELIC



source:
http://www.brazil.gov.br/

There is a Brazil that most people know

Amazon forest

Soccer

Carnival

Rio de Janeiro

It keeps being successful, but there is still more to know…

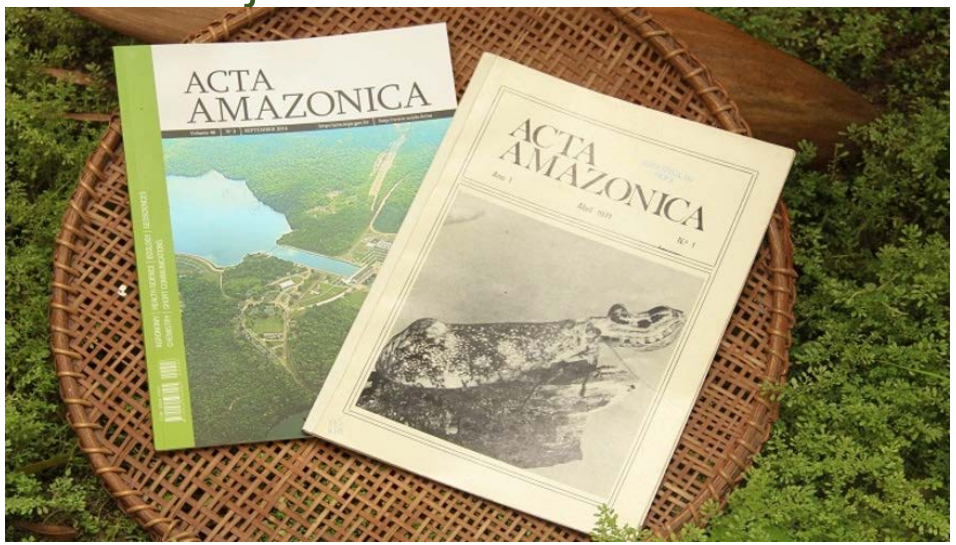
The Brazil you must know

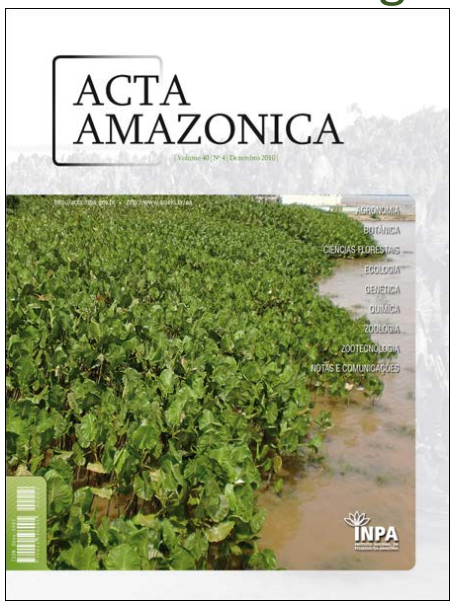
Technology, Innovation, Development, Competitiveness

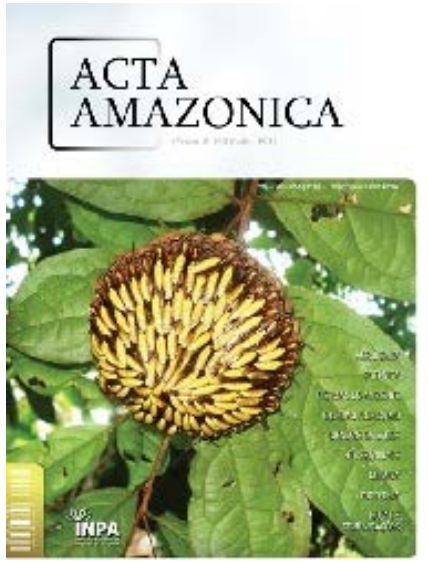
Strong Emphasis in Science-Based Development

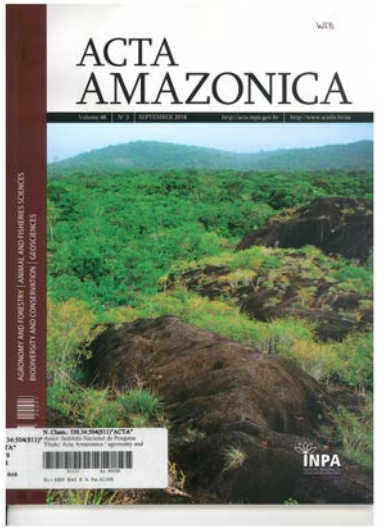
INPA – *Instituto Nacional de Pesquisas da Amazônia*
National Institute of the Amazon Research

- **INPA has 64 years of existence, doing scientific research, basic and applied.**
  - It has a set of thematic laboratories: Molecular Biology, Soil, Plants, Images Geoprocessing, Natural Products Chemistry, "*Vivarium*" and Electronics Microscopy.
  - It maintains a Scientific collection of the major flora and fauna of the Amazon Region.
- **ACTA AMAZONICA** is a multidisciplinary, peer-reviewed, open access, free-of-charge, quarterly scientific journal for research in and about the Amazon Region, published since 1971.







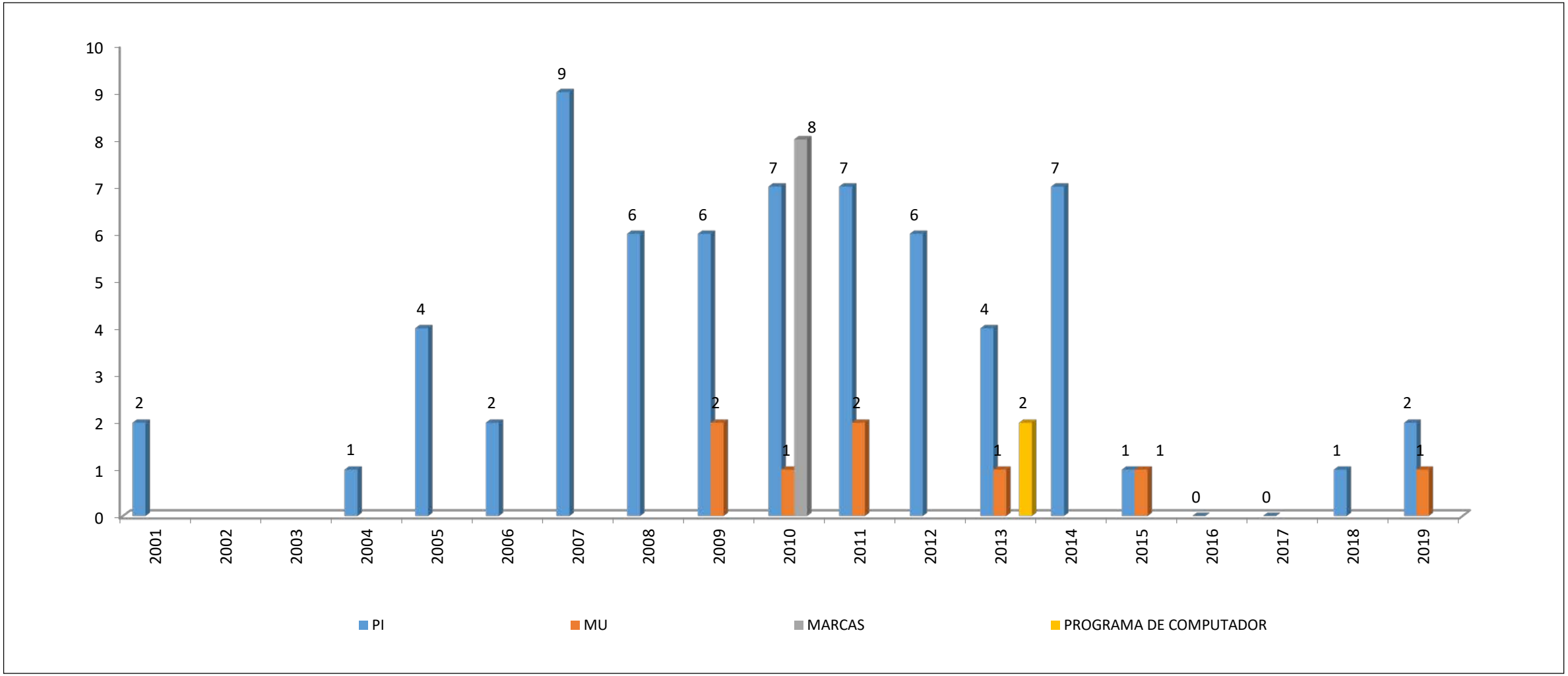


http://portal.inpa.gov.br/

INPA – *Instituto Nacional de Pesquisas da Amazônia*

National Institute of the Amazon Research

PI Indicators: 73 PATENTS filled and 17 PATENTS Issued



Source: www.inpacoeti.me

INPA – *Instituto Nacional de Pesquisas da Amazônia*

National Institute of the Amazon Research

Fields of Use of the PATENTS filled

Field of Use	Number of Patents filled	%
Agro	7	9,6%
Food and Drinks	20	27,4%
Appliances and Equipments	7	9,6%
Construction	4	5,5%
Cosmetics and Hygiene	5	6,8%
Furniture	4	5,5%
Sustainable Products	5	6,8%
Health	21	28,8%
Total	73	100%

Source: www.inpacoeti.me

INPA – *Instituto Nacional de Pesquisas da Amazônia*
National Institute of the Amazon Research

Technology Transfer: **73 ready** to be transferred, **5 under NEGOTIATION**, and **1 INNOVATION,** with royalties already received.

1 – ***Piranha Soup:*** dehydrated snapshot soup and ***Piranha*** **cream soup**.

2 – ***OCA*** **for RODENTS (*Know-how):*** for enrichment of small rodents to be used in "*vivarium*".

3 – Fish GELATINE (*Know-how):* Fish Gelatine based on the Amazon species.

4 – Biofilms Removers: formed by "*Streptococus mutans*" It removes activity for the bacterium of human dental cavity.

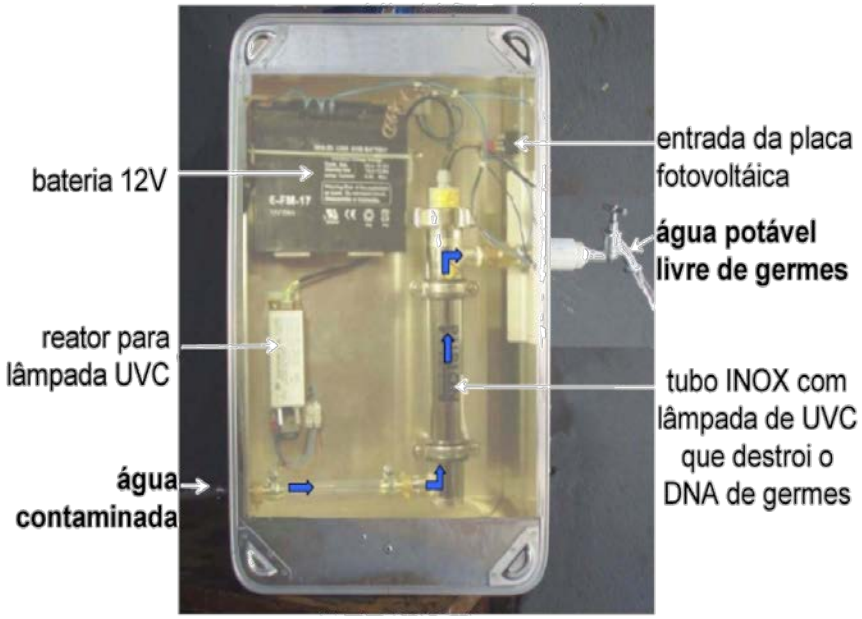
5 – Water Purifier: "*AGUABOX*"/**WATER BOX** Portable equipment for water purification.

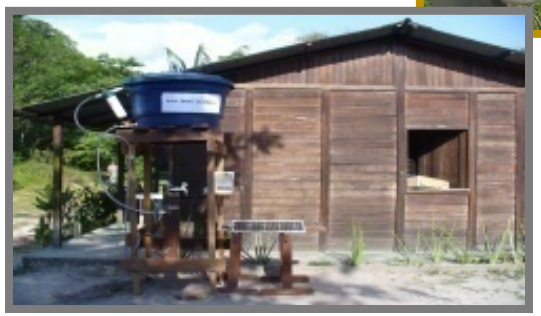
Source: www.inpacoeti.me

INPA – *Instituto Nacional de Pesquisas da Amazônia*
National Institute of the Amazon Research

❑ CASE: **Water Purifier**: **WATER BOX** - **Research** conducted by the Renewable Energy Lab.

- **2007: Natural product solar dryer** was presented to an Indian community **to add value to the forestry products**.
- The **Indians were interested** but **complained the water contamination** of the majority of the small rivers that were the water supply for them, and **the consequent diseases** (85% of the diseases & 60% of children death).
- The majority of the Indian communities have **no electricity, at that time**.
- **2008:** started the development of a solar water purification system.
- **The WATER BOX prototype was constructed, and installed** in the **"Morada Nova", an Indian Community.**

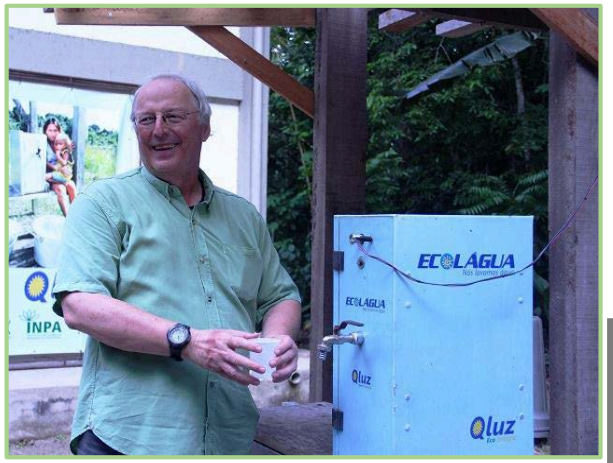




Source: www.inpacoeti.me

INPA – *Instituto Nacional de Pesquisas da Amazônia*
National Institute of the Amazon Research

CASE: **Water Purifier**: **WATER BOX** Technology Transfered = **INNOVATION**



October 31st, 2012 - CONTRACT SIGNED
with the "**Amazon Hightech Components**"

June 8th, 2016

Dr. Roland Vetter, **Inventor Awarded**, and
the Water Box is already in the Market Place.
The **INPA NIT (TTO) celebrates the royalties received.**

Source: www.inpacoeti.me

INT – *Instituto Nacional de Tecnologia*
National **Institute of Technology**

- **INT:** Created in 1921 **to investigate the industrial processes for the use of fuels and minerals** in the Country. Since then, INT has been recognized for researches on strategic themes for the country's development.
- **In the 1920s**, it developed **the alcohol-powered car.**
- **In the 1930s**, it initiated the development of research in **biofuels using various oilseeds as raw material**.
- **In the 1940s:**
  - The **concrete strength test method** was created, recognized and adopted worldwide as the **Brazilian Test;**
  - **It was developed** the processes that **made possible the use of eucalyptus pulp in the paper production**.

Agosto de 1925

Automovel Ford, especialmente preparado na Estação Experimental de Combustiveis e Minerios (hoje Instituto Nacional de Tecnologia), que fez os percursos Rio-S.Paulo, Rio-Barra do Pirahy e Rio-Petropolis, alimentado com alcool de 70 Gráos e dirigido pelo engenheiro Souza Mattos

Brazilian Test - Ensaio de compressão diametral de um rolo de concreto, realizado pela Divisão de Materiais de Construção, década de 1940.

Divisão de Fibras Têxteis, Celulose e Papel, Fábrica-Piloto, década de 1940.

Source: www.int.gov.br/

INT – *Instituto Nacional de Tecnologia*
National **Institute of Technology**

Feiga Rosenthal com visitantes no Laboratório de Amido. Apresentação do Projeto do Babaçu. Usina de Curvelo, destinada à produção de álcool de mandioca.

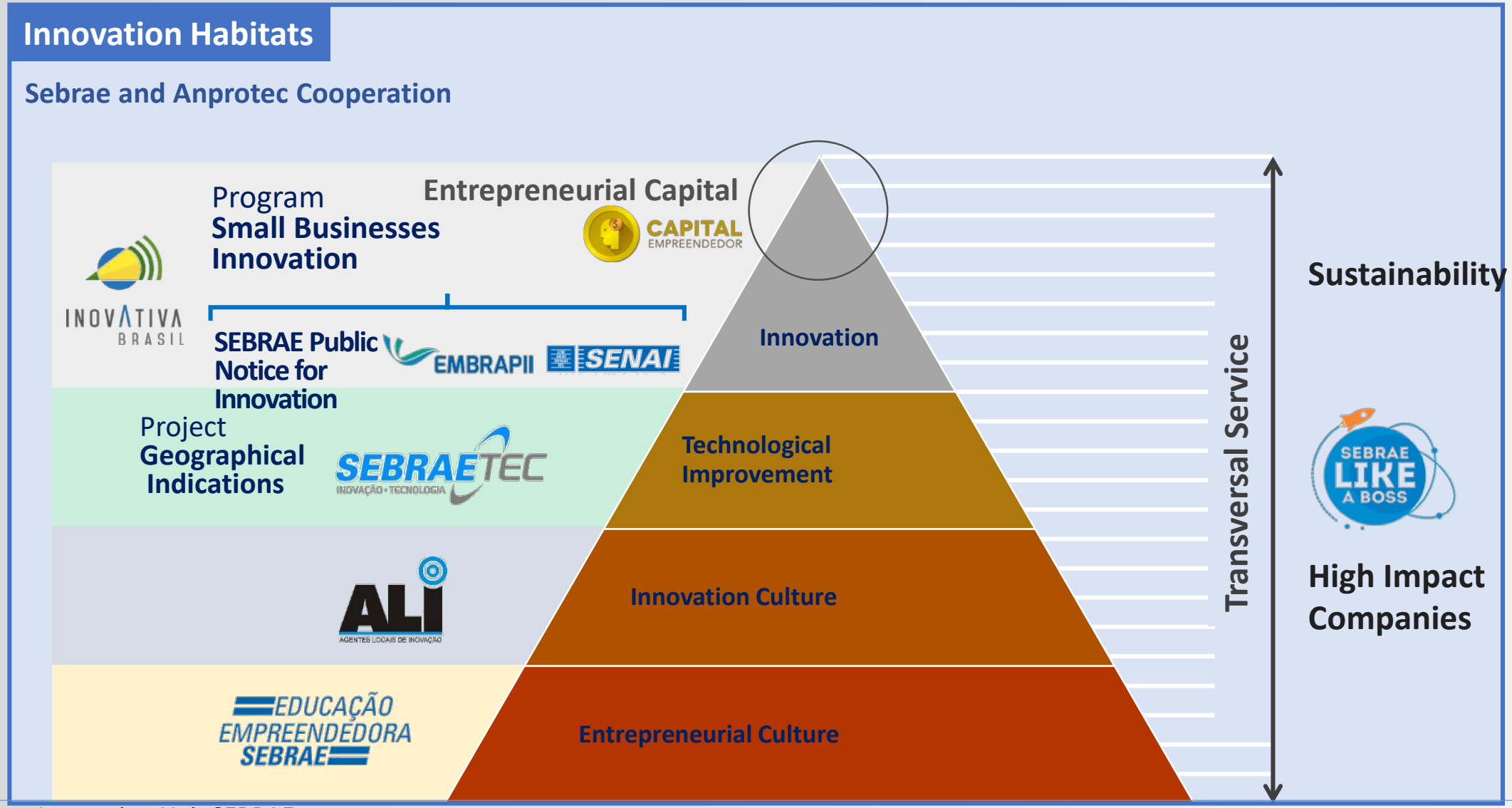
- **In 1970**, it was installed a **pre-industrial plant to produce ethanol from cassava/manioc.**

- **In recent years, INT** has **strengthened its research on major such as biodiesel, nanotechnology, oil and gas, health products, renewable energy, and also industrial chemical technology.** It has therefore expanded its technology transfer actions to society through its Centres for Technological Innovation (NIT/TTO), and Technological Extension Programs, such as the Brazilian Industrial Research and Innovation Program (EMBRAPII).

- **EMBRAPII** aims to promote innovation in large, medium and small companies, exploiting the established competence of the **Technology Institutes**.

Source: www.int.gov.br/

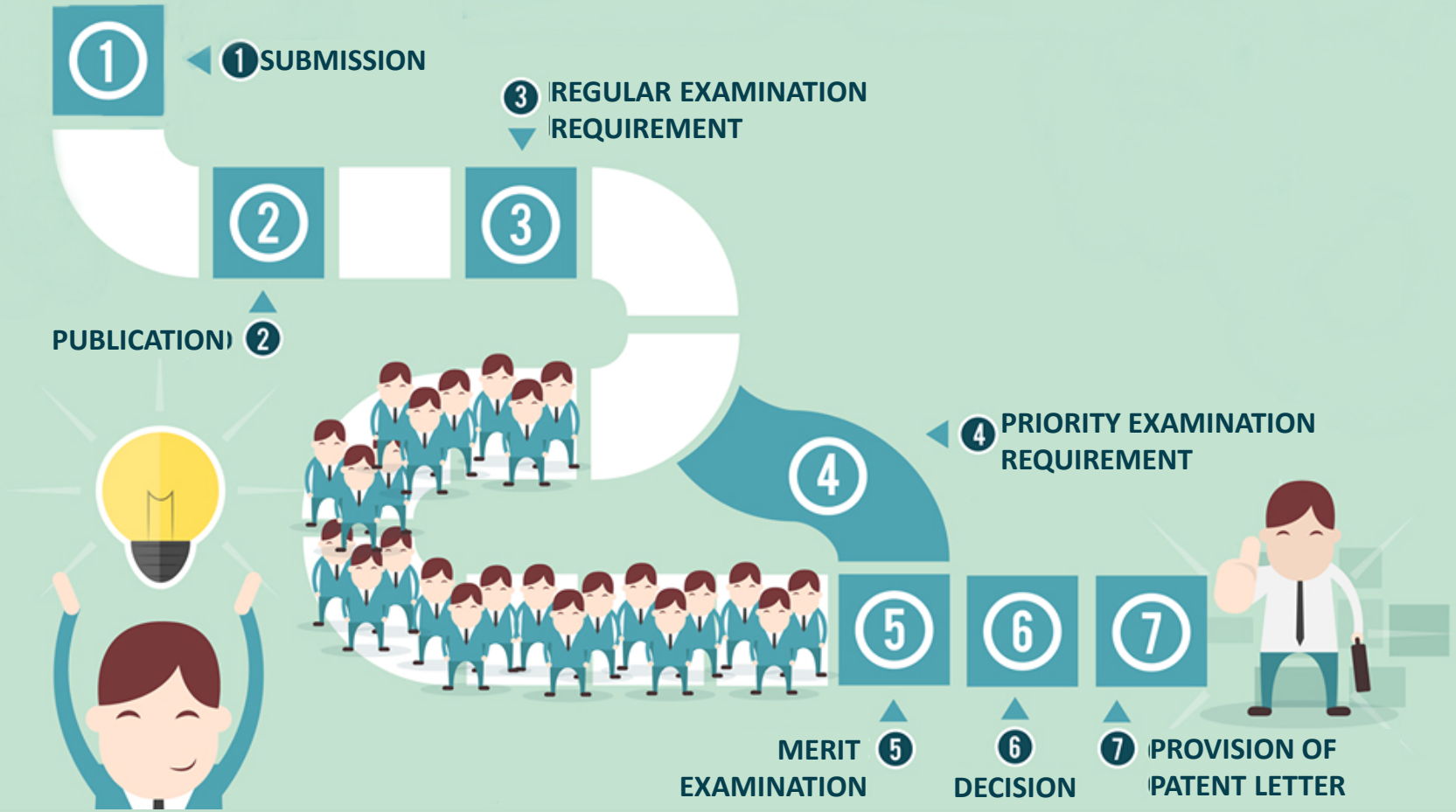
Intervention x complexity



Source: Innovation Unit SEBRAE

MSB PATENT

In addition to Sebraetec service, the Intellectual Property service focuses on encouraging and consolidating the strategic use of intellectual property assets from small businesses.



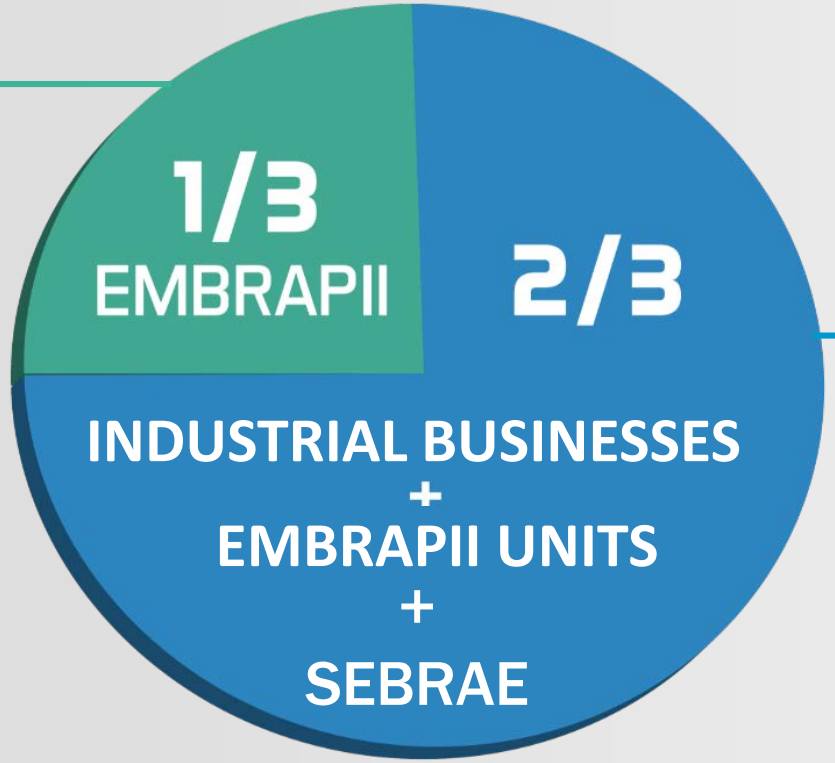
PRIORITY PATENT EXAMINATION
PR Resolution no. 160/2006

INPI INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL

Source: Innovation Unit SEBRAE

Contract EMBRAPII | Fundraising composition Embrapii Unit | Amount of projects

Non-Refundable Funds
Continuous Flow



Industrial Companies
Financial Resources:
- FINEP, BNDES, SEBRAE
- Development Banks
- Obligation: ANP, ANEEL, Computing law, others

EMBRAPII Unit/Center:
Economic Contribution and/or Financial Contribution

Source: Innovation Unit SEBRAE

ITA – *Instituto Tecnológico da Aeronáutica*
Technological Institute of Aeronautics

- **ITA was conceived to structure and implement an R&D governmental organization** with other institutes that integrated the **Aerospace Science and Technology Department- DCTA**, counting on experienced professors and researchers, to teach and to do research aiming at transfer the knew knowledge and technology to the Brazilian society.

- **EMBRAER** was born **in 1969**, at the **CTA-Aerospace Technical Centre, actual DCTC**, where it was designed and developed the first aeroplane called ***Bandeirante*** under the leadership of the engineer Ozires Silva, **graduated at ITA** that was part of the **CTA**.

- **ITA** have the "**ITA Junior"** & **"APG-ITA",** born by the students initiatives to develop their projects. There is also the "INCUBAERO" that houses 10 enterprises and 20 have been already graduated.

Source: www.embraer.com/br

EMBRAER

- Boeing and Embraer have opened a joint sustainable aviation biofuel research centre in a collaborative effort to further establish the aviation biofuel industry in Brazil.
- In 2017, Embraer was announced as an Uber Partner. The electric flying taxi service that Embraer S.A. is working on with Uber is ‘likely’ to launch in 2024. Engineers are projecting one-tonne vehicles transporting a pilot and 4 passengers at an altitude of 800 to 1,000 meters (2,600-3,300 feet). The aircraft is to be powered by batteries that can charge in as little as 5 minutes between flights.

Source: www.embraer.com/br

Institutional Building and Strengthening: Brazil has created a large research system for agriculture

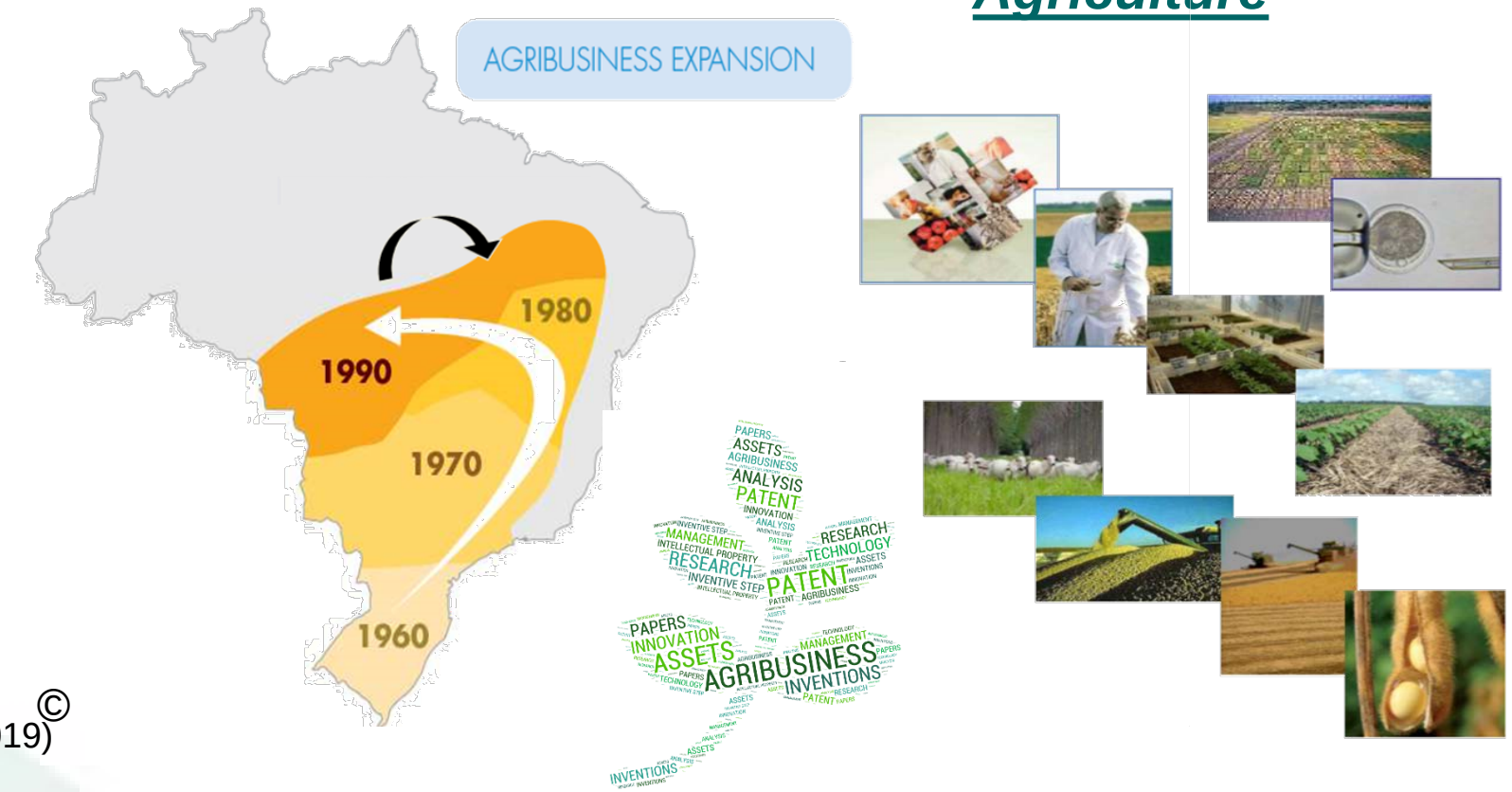
THE BRAZILIAN AGRICULTURAL RESEARCH CORPORATION

- ✓ 42 Research Centers Dedicated to Technology Development
- ✓ Largest Agricultural Research Organization in Latin America

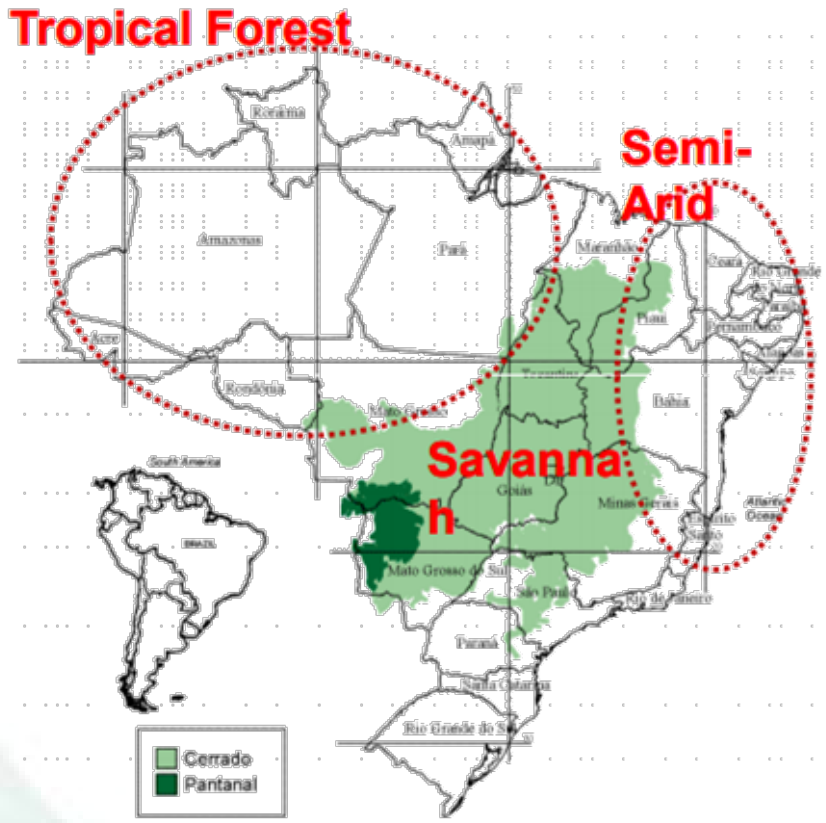
Technology, Innovation and Agriculture

- ✓ **Employees: 9,843**
  - ✓**Total Scientists: 2,415**
  - ✓**Researchers with PhD/DSc: 2,182**

Embrapa has been helping Brazil to developed a Science-Based, Advanced <u>Tropical Agriculture</u>



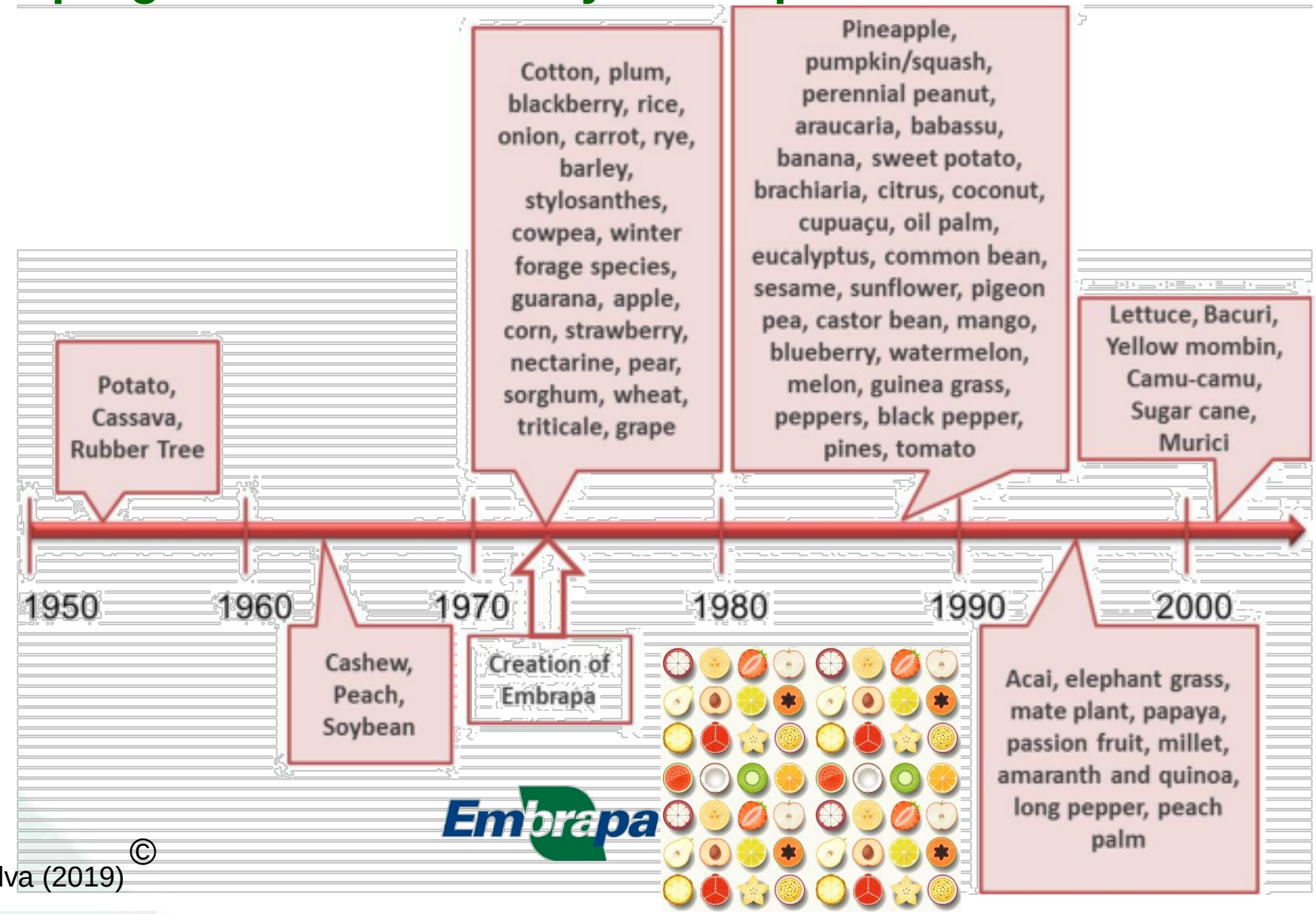
Challenges to Agricultural Production in Brazil



Before the 1970´s Brazil was not a food secure country.

- Low agricultural production and low yields;
- Production concentrated in the South and Southeast Regions;
- Constant food supply crisis and rural poverty;
- Lack of specific knowledge in Tropical Agriculture;
- Lack of adequate agricultural development policies;
- Brazil known as coffee and sugar producer.

Period corresponding to the beginning of the activities of plant breeding programs conducted by Embrapa

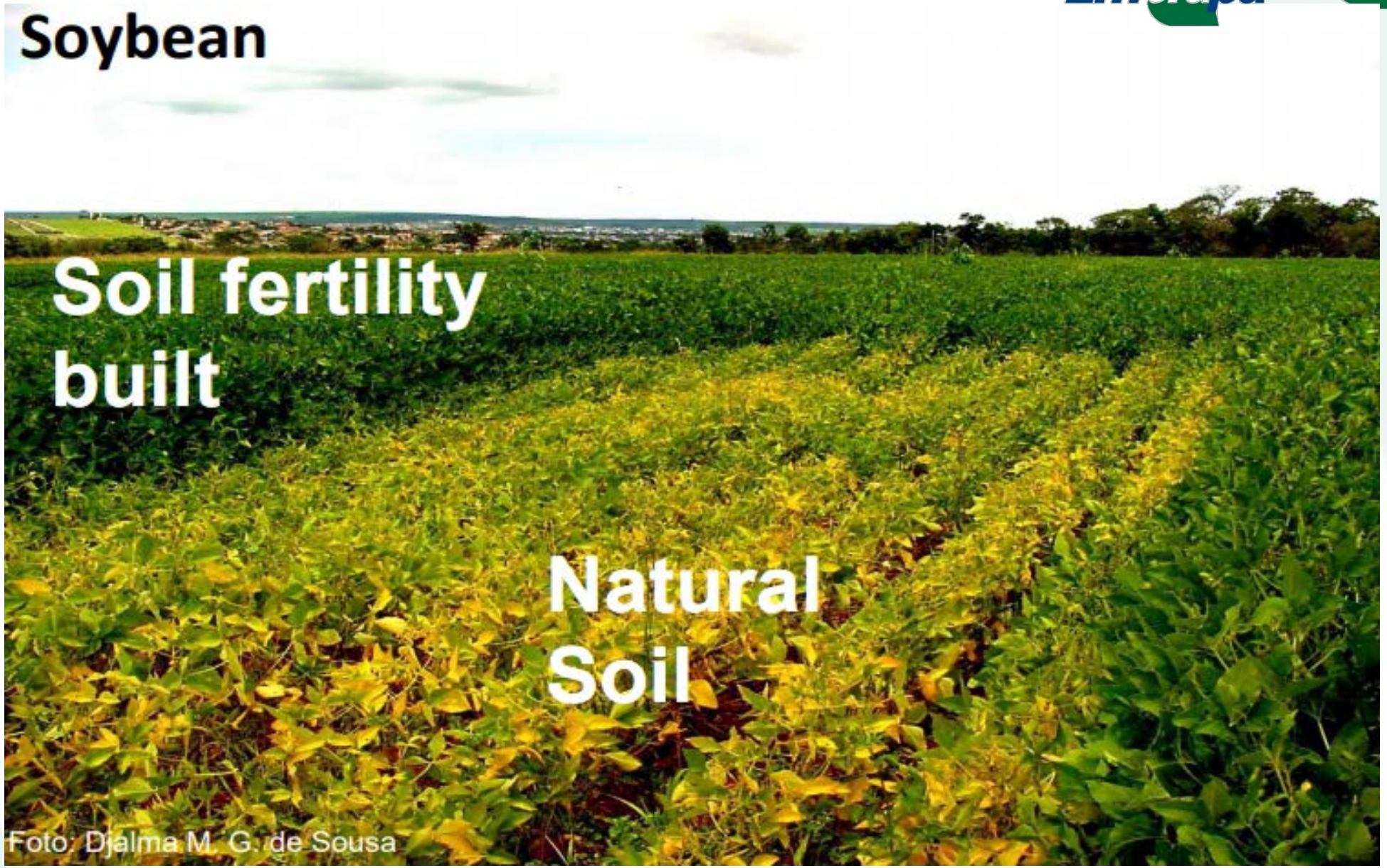


Brazil Developed a Science-Based Advanced Tropical Agriculture

Brazilian Scientists had to “Tropicalize” Soybeans and Other Species.

Embrapa invested vigorously in genetic resources, searching for germplasm suitable for tropical and subtropical conditions.

Soybean

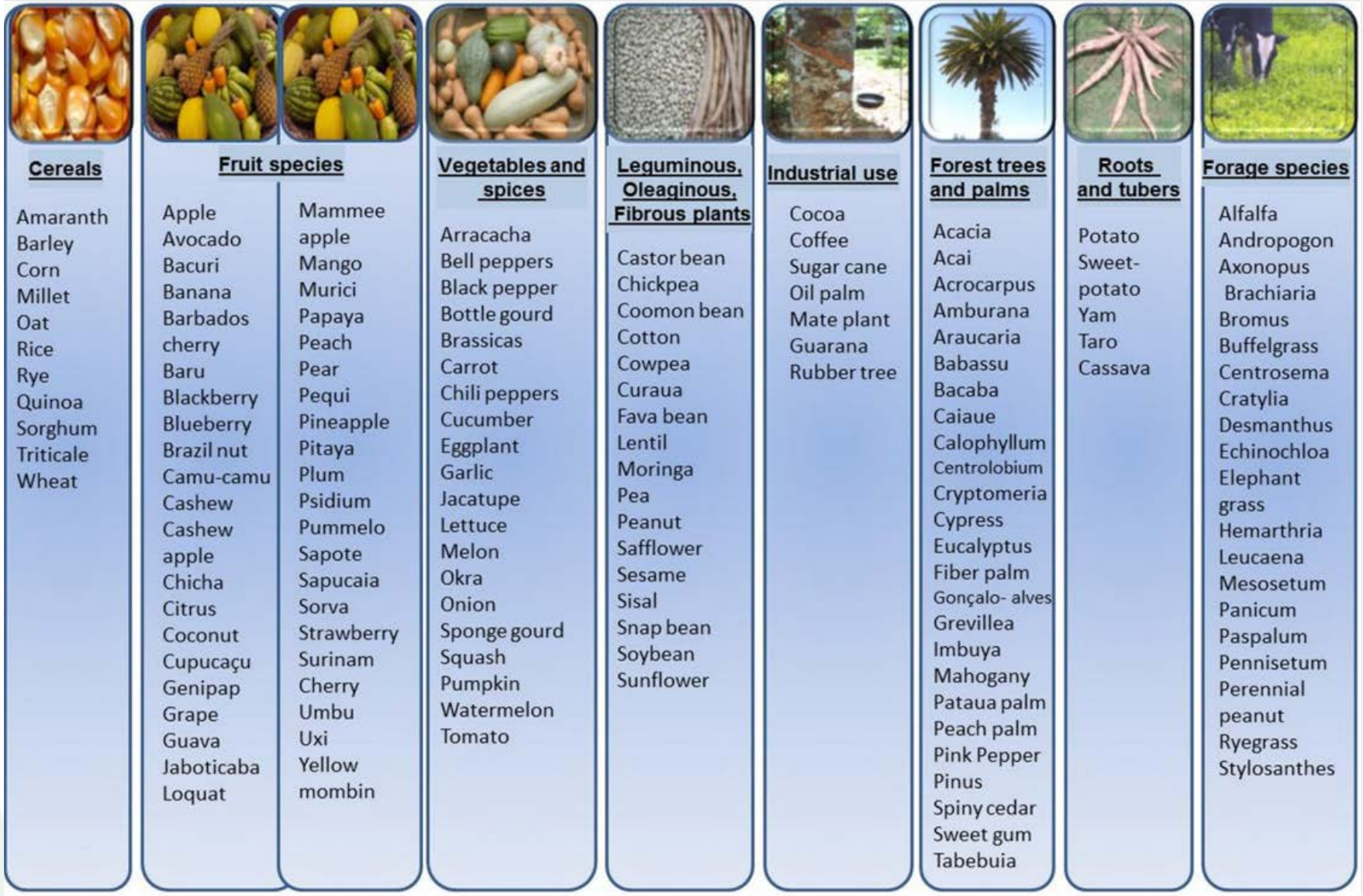


More Sustainable Cropping Systems in the Tropics

Biological Nitrogen Fixation with *Bradyrhizobium* strains

Anual economy:
> US$ 7 billion

Embrapa and partner institutions are responsible for the conservation of approximately 300,000 accessions in Germplasm Banks of distinct plant species distributed



Cereals

Amaranth
Barley
Corn
Millet
Oat
Rice
Rye
Quinoa
Sorghum
Triticale
Wheat

Fruit species

Apple
Avocado
Bacuri
Banana
Barbados cherry
Baru
Blackberry
Blueberry
Brazil nut
Camu-camu
Cashew
Cashew apple
Chicha
Citrus
Coconut
Cupucaçu
Genipap
Grape
Guava
Jaboticaba
Loquat
Mammee apple
Mango
Murici
Papaya
Peach
Pear
Pequi
Pineapple
Pitaya
Plum
Psidium
Pummelo
Sapote
Sapucaia
Sorva
Strawberry
Surinam Cherry
Umbu
Uxi
Yellow mombin

Vegetables and spices

Arracacha
Bell peppers
Black pepper
Bottle gourd
Brassicas
Carrot
Chili peppers
Cucumber
Eggplant
Garlic
Jacatupe
Lettuce
Melon
Okra
Onion
Sponge gourd
Squash
Pumpkin
Watermelon
Tomato

Leguminous, Oleaginous, Fibrous plants

Castor bean
Chickpea
Coomon bean
Cotton
Cowpea
Curaua
Fava bean
Lentil
Moringa
Pea
Peanut
Safflower
Sesame
Sisal
Snap bean
Soybean
Sunflower

Industrial use

Cocoa
Coffee
Sugar cane
Oil palm
Mate plant
Guarana
Rubber tree

Forest trees and palms

Acacia
Acai
Acrocarpus
Amburana
Araucaria
Babassu
Bacaba
Caiaue
Calophyllum
Centrolobium
Cryptomeria
Cypress
Eucalyptus
Fiber palm
Gonçalo- alves
Grevillea
Imbuya
Mahogany
Pataua palm
Peach palm
Pink Pepper
Pinus
Spiny cedar
Sweet gum
Tabebuia

Roots and tubers

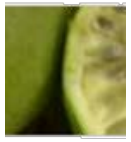
Potato
Sweet-potato
Yam
Taro
Cassava

Forage species

Alfalfa
Andropogon
Axonopus
Brachiaria
Bromus
Buffelgrass
Centrosema
Cratylia
Desmanthus
Echinochloa
Elephant grass
Hemarthria
Leucaena
Mesosetum
Panicum
Paspalum
Pennisetum
Perennial peanut
Ryegrass
Stylosanthes

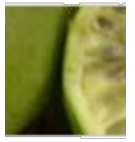
Lopes, Mauricio & Faleiro, Fábio & Elias Ferreira, Márcio & Lopes, Daniela & Vivian, Rafael & Silva Boiteux, Leonardo. (2012). Embrapa's contribution to the development of new plant varieties and their impact on Brazilian agriculture. Crop Breeding and Applied Biotechnology. 12. 31-46. 10.1590/S1984-70332012000500005.

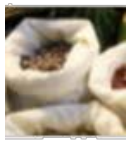




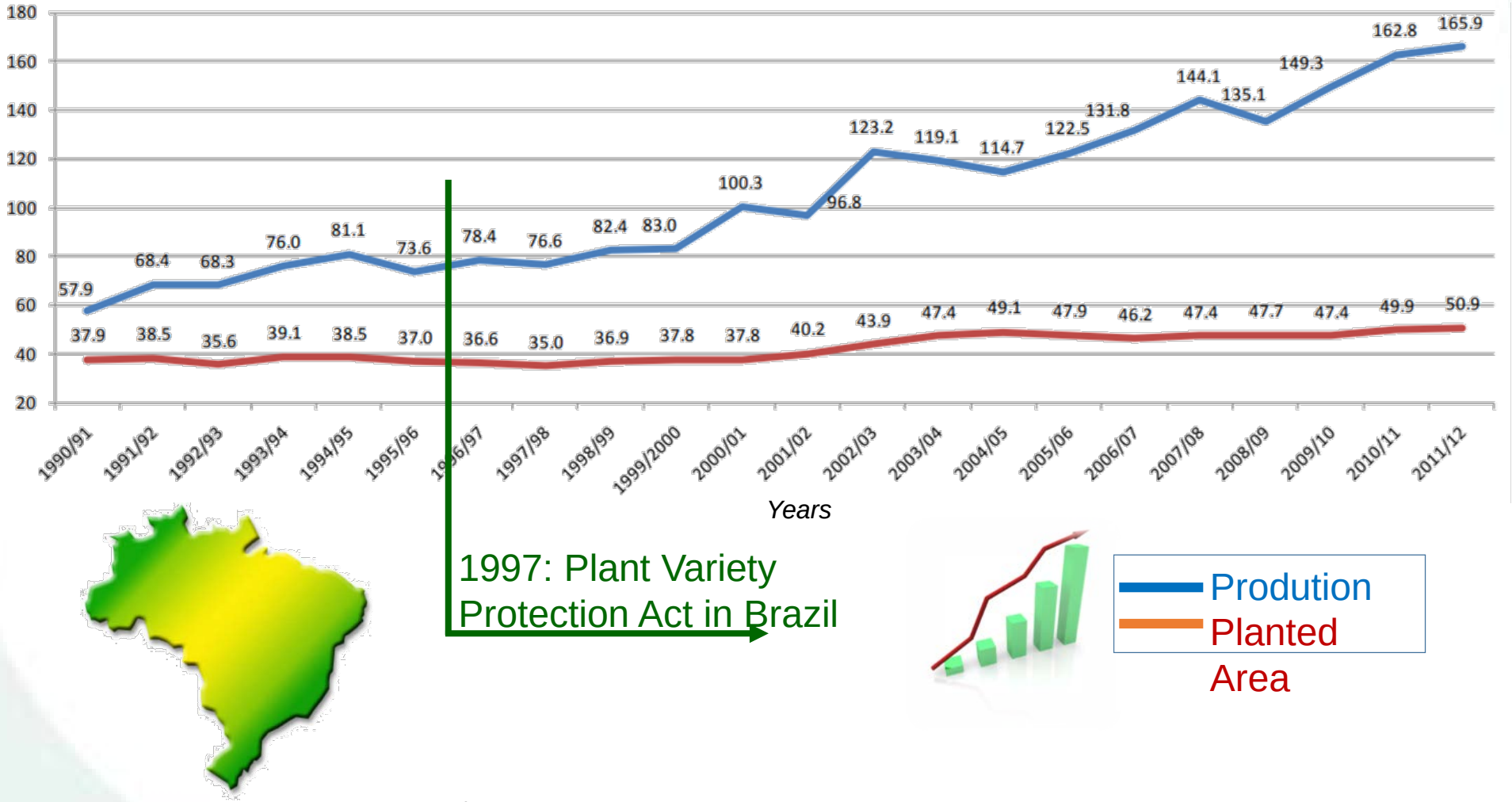

Genetic diversity adequately preserved, accessed and used will continue to be the basic foundation for the continued success of breeding programs aimed at developing new varieties, cultivars and lines.





Evolution of domestic grain production (in millions of tons) and of the respective planted area (in millions of hectares)



SANTOS, Fabrício Santana et al. Evolution, importance and evaluation of cultivar protection in Brazil: the work of the SNPC. Crop Breed. Appl. Biotechnol. [online]. 2012, vol.12, n.spe [cited 2017-11-10], pp.99-110. Available from: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1984-70332012000500011&lng=en&nrm=iso>. ISSN 1984-7033. http://dx.doi.org/10.1590/S1984-70332012000500011.

749 PVP applications in Brazil

Year	2016	2017	2018
P a	32	35	39

12 PVP Processes outside Brazil (US and Latin America)

Embrapa, Sibelle A. Silva (2019)

15 Cultivar in the process of protection outside Brazil

749 Cultivar protected in Brazil

125 Software Registered

PI Management:

2224

PI protection in **44** countries

429 Patent filled in Brazil

423 Patent protection in **43** countries

452 Trade Marks protected in Brazil

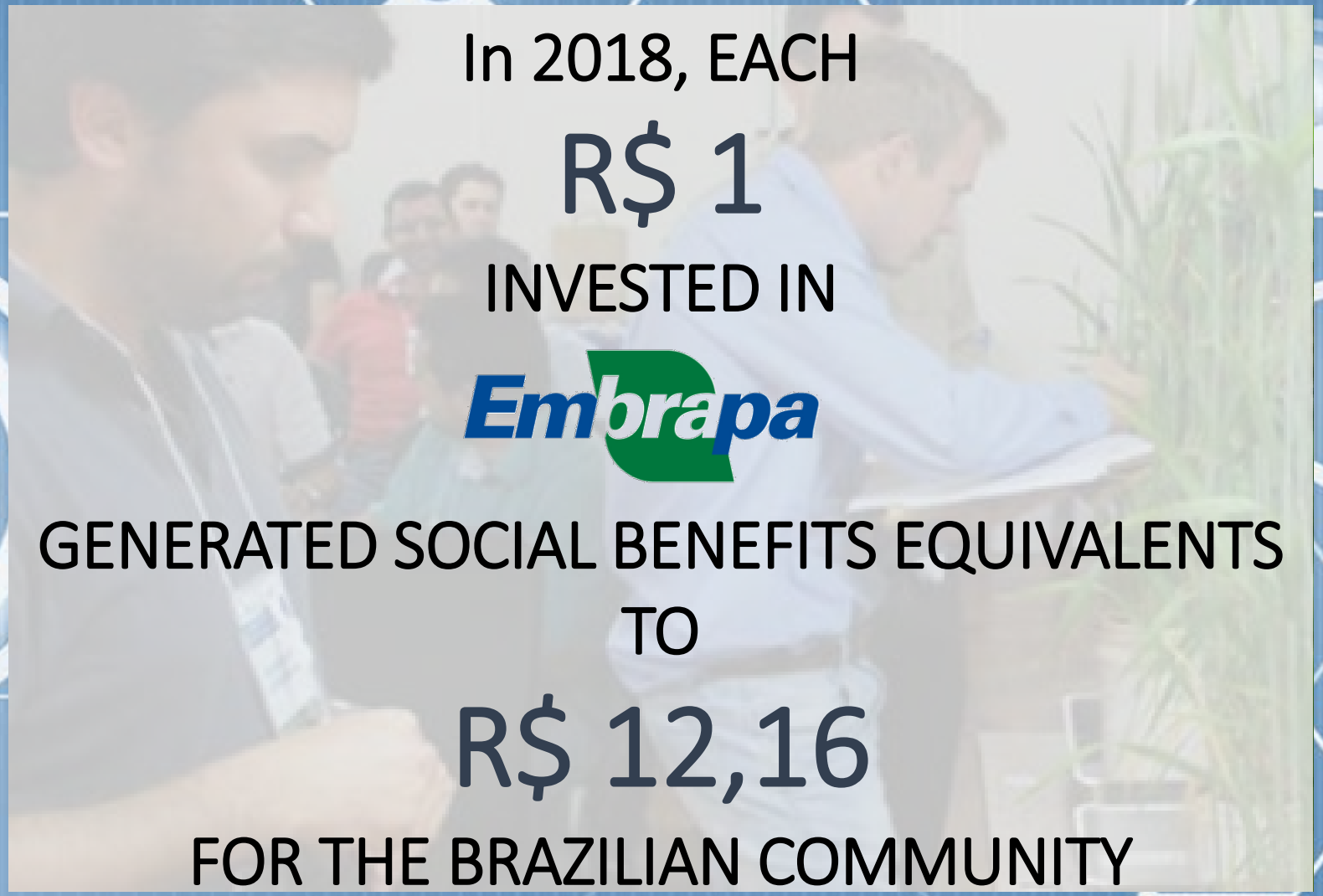
1933 Cultivar commercially protected in Brazil

brapa/SIN – Dados até dez/2018.

STRUCTURING PROJECTS

Development projects implemented in partnerships between Embrapa and one country or a group of countries

- ✓ Strengthen their technological, institutional, and human resource bases necessary for sustainable agricultural development.
- ✓ Example: Embrapa has implemented the **Cotton 4 + Togo** project in Benin, Burkina Faso, Chad, Mali, and Togo in partnership with the Brazilian Cooperation Agency (ABC).



In 2018, EACH

R$ 1

INVESTED IN

Embrapa

GENERATED SOCIAL BENEFITS EQUIVALENTS TO

R$ 12,16

FOR THE BRAZILIAN COMMUNITY

Source: Embrapa, Social Report (2019)

2018: Jobs + Technology + Cultivar = SOCIAL BENEFITS

69.936 New Jobs created

165 New technologies

220 Cultivars

1039 Relevant Social Initiatives:

33% Promotion of genre equality;

43% Capacity building, technological updating, interchange of knowledge;

9% Consulting and technological subsidies for public and private sectors;

118 Awards for the collaborators.

Source: Embrapa, Social Report (2019)

Source: Embrapa, Social Report (2019)

FIOCRUZ

Oswaldo Cruz Foundation was created on May 25, 1900.
It was first called Serum Therapeutic Institute, and its objective was to produce serums and vaccines against the plague.

Promote health and social development, generate and disseminate **scientific and technological knowledge**, and be an **agent of citizenship**. These are the **concepts that guide the actions of Fiocruz**, the most prominent institution of science and technology in health in Latin America.

Research and teaching:

Innovation Portfolio

The innovative projects at Innovation Portfolio were organized on the basis of society health needs.

Invivo

Interactive virtual site that provides information about health, science and technology to help people to understand scientific processes and progress and its impact on everyday life.

Heath Economic-Industrial Complex (Heic)

The Health Economic-Industrial Complex (Heic) is a theoretical reference that proposes a link between health and economic development.

Source: https://portal.fiocruz.br/en/foundation

FIOCRUZ

Production: One of its main missions is **manufacturing strategic products for the Brazilian Unified Public Health System** (SUS).

- Its **Drug Technology Institute (Farmanguinhos) contributes with** nearly **40% of the drug purchased** by the Ministry of Health from official laboratories, but accounts for only **5% of these expenditures**.

Immunobiological Technology Institute (Biomanguinhos)

The Institute guarantees Brazilian self-sufficiency in essential vaccines demanded by Brazilian vaccination schedule.

- **Biomanguinhos** is the **world's largest manufacturer of the vaccine against yellow fever**, and the only Latin American laboratory certified by the World Health Organization (WHO) for this purpose.
- It manufactures **vaccines against polio, meningitis A and C, MMR, monovalent Hib and Hib+DTP**.
- In addition to vaccines, produces **about six million reagents for diagnosis of HIV-1, HIV-1 / 2, Chagas' disease, dengue fever, leishmaniasis and leptospirosis.**

Source: https://portal.fiocruz.br/en/foundation

FIOCRUZ

Technology detects zika in Aedes 18 times faster

- Based on **chemical analyses by infrared rays** capable of speeding the **monitoring of the presence of zika** in Aedes aegypti mosquitoes **by 18 times**, and of cheapening it by **116 times.**
- Known as **'near-infrared spectroscopy'**, the technique **is simple**, has a **high accuracy rate** and **requires no use of reagents**: attributes that make it a potential alternative to the traditional method of genetic analysis adopted for the same purpose, known as qPCR.
- It is **expected that the technique will also be evaluated for other viruses such as dengue and chikungunya**, as well as for the detection of the parasite that causes malaria.

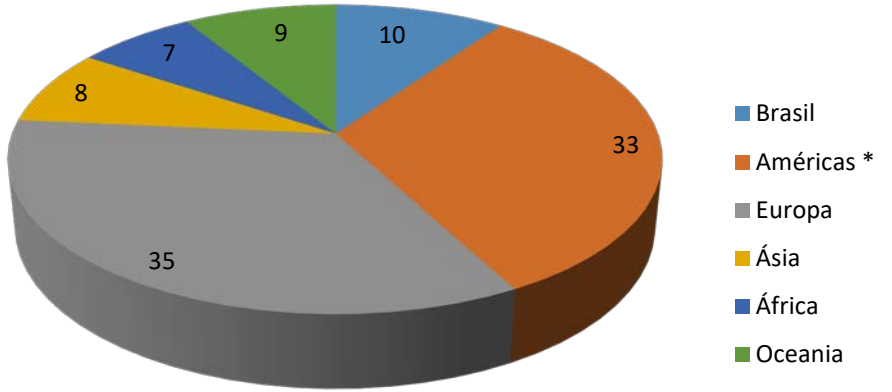
Financing

The study was funded by the United States Agency for International Development; Stars in Global Health program from Canada; National Council for Scientific and Technological Development (CNPq); and Carlos Chagas Filho Foundation for Research Support of the State of Rio de Janeiro (Faperj).

Source: https://portal.fiocruz.br/en/foundation

FIOCRUZ – Patent & Innovation Portfolio

Distribution of Fiocruz Patents



EQUIOMENTS

- Containment box for rodents
- **Cup to feed babies at risk**
- Apparatus to support infants in hospital bed
- Device to maintain venous puncture
- Containment device
- Easy-to-fix sheets for hospital beds
- Chair to prevent gastroesophageal reflux
- Cushion to keep patient in decubitus position
- Support to maintain children in a sitting position
- Trap to monitor and control Culex mosquitões
- Toys for monkeys at captive
- Equipment for cleaning and disinfection of endoscopes
- Equipment to determine dimensions of male condoms
- Equipment to analyze integrity of condom packages
- **EVIDENGUE – mesh cover against mosquito Aedes aegypti in water containers collectors**

BIOCIDES

- **Biopesticide: Dengue, Malaria and Filariasis**
- Bioinsecticide of high yield
- **Insecticide** against the **mosquito vector of Dengue fever**
- Standard powder intended to quality control of bacterial biological insecticides of Bacillus thuringiensis sorovar israelenses
- Environmental microbial origin for bioremediation.

Source: https://portal.fiocruz.br/en/foundation

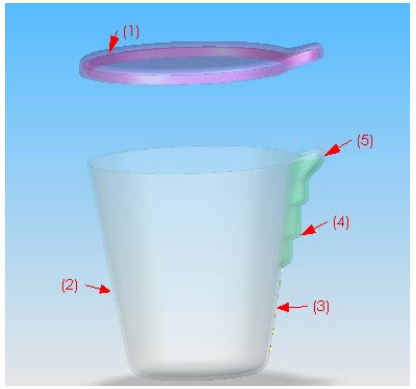
FIOCRUZ - Innovation & Tech Transfer Semples

Patents Issued:
Brazil
Argentina
México

DengueTech®

Licensed in 2011
TT & Development in collaboration with enterprise

Patent Issued:
Brazil



Cup to feed babies at risk

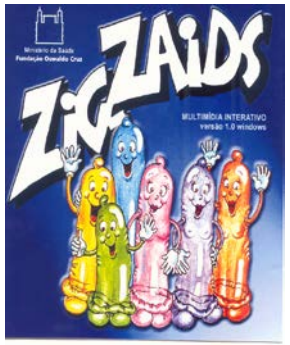
Innovation with Impact in Hospital and Heath Care

Licensed to a Small Enterprise of Rio de Janeiro State

BIOTERC
CONTROLE GERENCIAL DE BIOTERIOS

Software for
"Vivarium"
Management Control

Innovation with Impact In Management



Innovation with Impact Socio-Educational

Source: karla.montenegro@fiocruz.br

FIOCRUZ - Innovation & Tech Transfer Semples

Patents Issued:
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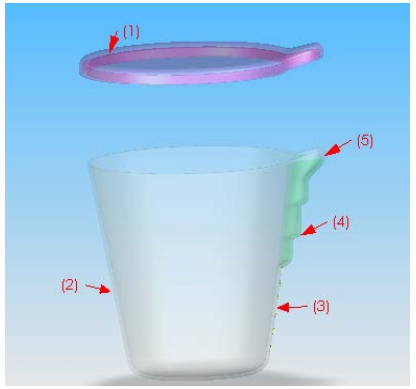


Cup to feed babies at risk

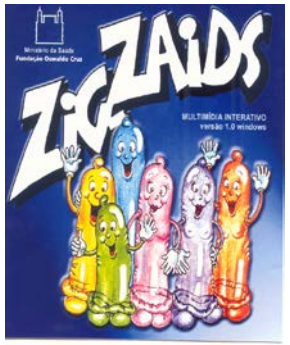
Innovation with Impact in Hospital and Heath Care

Licensed to a Small Enterprise of Rio de Janeiro State

BioterC®
CONTROLE GERENCIAL DE BIOTERIOS

Software for
"Vivarium"
Management Control

Innovation with Impact In Management



Innovation with Impact Socio-Educational

Source: karla.montenegro@fiocruz.br

Innovation at Fiocruz: Inventors & Partners

Cup to feed babies at risk

IFF/Biomédica (RJ)

Right Time: fast synchronization of events at signal of EEG without computational systems

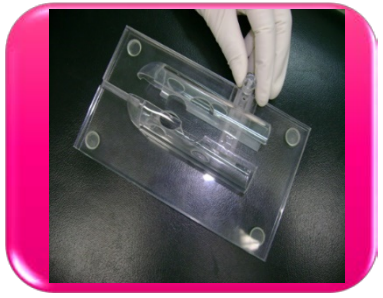
IFF/Startup

Bioterc: Software de gerenciamento de biotérios

ICC/*CITS*

SM14: Vaccine tetravalent for *esquistosomosis & fasciolose* (Veterinary)

IOC/ Orygen/ Ourofino



Device for rodents control

IRR/ Solução integrada comercial LTDA (MG)

Denguetech: Inseticida biológico

FAR/BR3

Dissulfiram & Benzonidazol for Chagas treatment

IGM, SEFAR e FAR

Mosquito trap: IAM (BR-OVT) e IOC (MosqTent)

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